

tissue showing the mycelial threads of the aecidium which permeate the leaf tissue in all parts of the affected spots; 16, a few of the pseudoperidial cells highly magnified to show their true shape.

EDITORIAL.

ONE OF THE hard questions that working botanists are called upon to answer, especially those who are also concerned in training botanists, is "what original work shall I do?" The background of the question usually contains no literature and no appliances other than a few standard botanical works and a microscope. There seems to be a widespread notion that when one comes into the possession of a compound microscope he is equipped for "original work." The lack of literature and collections precludes the recommendation of any systematic work. The general lack of knowledge as to the ease with which certain important physiological phenomena can be observed, usually excludes any such answer to the question. Besides, the applicant for "original work" expects that it will involve doing something with his microscope. Nine times out of ten the advice will be given to study the minute anatomy of some plant, as the easiest thing to do. Naturally this is the expected advice, and sectioning and drawing begin at once. But the proper study of the minute anatomy of any plant is far from being "the easiest thing to do," and to recommend any such study to one who has not been thoroughly trained by a competent instructor, is to make a great blunder.

IN THE first place, the ability to correctly interpret is not in the possession of any tyro who can cut a section or focus a microscope. There are more optical illusions due to the microscope than to anything else, and it is chiefly these illusions that will be drawn and reported when difficult, and hence interesting, structures are being investigated by an untrained observer. The unrecognized hiatuses in what appears in the field of the microscope may be small enough when measured by the metric system, but they may be of infinite importance in the interpretation of structures. Such work can only be done by the most careful and reiterated labor of a trained observer. Of course all this only applies to cases where publication is contemplated, for any amount of valuable information may be obtained in a very pleasant way by any one who is doing such work merely for his own edification. But when work rises to the dignity of being called "original investigation," it is proper that it be hedged about by a full knowledge of its real difficulties.

IN THE second place, the claim that no library is needed for such work, and that all that one needs is a microscope, is a mischievously false notion. It is far easier to-day to command a literature that will enable one to do some systematic work upon the flora of North America, than one which will enable an anatomist to properly discuss an anatomical subject. The absence of references to literature (and by this is not meant foot-note references) in such investigation leaves the work "in the air." It is like shooting with a shotgun in the general direction of the game in the hope of hitting something. If the investigator is not prepared to say what he has found that is new, no one else is apt to take the trouble to do it for him. The sooner we can get rid of the notion that a microscope is a magic instrument, which when touched transforms one into an original investigator, the better. It is just as magical as a hand-saw, of which tool one may possess a chest-full, and yet not be a carpenter.

CURRENT LITERATURE.

The grasses of dry climates.¹

The author of this paper calls attention to some hitherto unknown peculiarities in the grasses of dry climates, among them being the singular development of the lowest internodes of the culms, shoots and basal leaves. He considers these characters just as important as the interior structure of the leaves for adaptation to a dry climate. He distinguishes: 1. tuberous and bulbous grasses; and 2. tunic-grasses. Tuberous grasses are such as *Phleum pratense* var. *nodosum* Gaud. and *Arrhenatherum avenaceum* var. *nodosum* (*Avena nodosa* L.), of which one or more of the basal internodes of the culm and shoots attain a tuberous development, while *Poa bulbosa* L. represents a bulbous grass, since here the bases of some of the sheaths of the leaves have increased in thickness and form a bulb very much like that of an *Allium*. The tuberous grasses are relatively rare in comparison with those whose culms are not thickened, a circumstance which has led to their being ranked as mere varieties. Such forms are especially prevalent in the Mediterranean countries. The same is also the case with *Poa bulbosa*, which occurs more commonly in these countries than further north. Besides the above mentioned, are the tuberous

¹ E. HACKEL.—Ueber einige Eigenthümlichkeiten der Gräser trockener Klimate.—Verhandlungen der k. k. zool.-botan. Gesellsch. Wien, Jahrgang 1890, pp. 125-138.